character of the plant remains which compose it, and to a much less degree on the chemical and physical conditions to which it has subsequently been exposed. It is accordingly clear that the study of coal is to a very large extent within the domain of the biologist, for certainly no adequate conception of the problem can be reached without his cooperation.

There are a few slips on the part of the author; for example he states that anthracite and cannel differ from ordinary so-called bituminous coal and oil shale or boghead respectively, by the fact that they contain little or no ash. Obviously this statement does not generally hold of these types of coal as mined in North America. ARBER has confined his observations in this respect to European coals. His book is nevertheless planned on the broadest lines, and is commended to all who wish to obtain a clear conception of our present knowledge of coal.—E. C. JEFFREY.

NOTES FOR STUDENTS

Recent work in gymnosperms.—In 1910 SCOTT and MASLEN established the genus *Mesoxylon* to include certain paleozoic stems intermediate in structure between *Poroxylon* and *Cordaites*, giving diagnoses of five species. One of these (*M. Sutcliffii*) has been described in detail by MASLEN,[4] and now two more species are described by SCOTT.[5] The conclusion is reached that *Mesoxylon* is "the last link in the chain of fossil types connecting the Pteridosperms with the typical *Cordaites* of the Upper Paleozoic," being definitely distinguished from it only by the presence of centripetal xylem in the stem. A critical discussion of the relationships of the new genera recently established by ZALESSKY is also given.

Mrs. THODAY and Miss BERRIDGE[6] have made an anatomical investigation of the strobili of four species of *Ephedra* (*E. altissima*, *E. distachya*, *E. fragilis*, *E. nebrodensis*). The "clearly bifid" stamen of the three last named species, each half bearing four bilocular synangia, is traced into other species in which the bifid character is not evident, but in which there are fusions of synangia into trilocular or even quadrilocular synangia, until *E. altissima* is reached with only two bilocular synangia. A reduction series is also traced from the staminate disk of *Cycadeoidea*, through other disks of Bennettitales, to *Ephedra*, where the disk is reduced to two segments, each bearing two pairs of bilocular synangia, and to *Welwitschia*, with its disk of six segments bearing trilocular synangia. It is also discovered that the solitary ovule of the species investigated is the product of a fusion of the two ovules of the biovulate species, since

[4] Rev. in BOT. GAZ. **52**:326. 1911.

[5] SCOTT, D. H., The structure of *Mesoxylon Lomaxii* and *M. poroxyloides*. Ann. Botany **26**:1011–1030. *pls. 87–90*. 1912.

[6] THODAY (SYKES), MARY G., and BERRIDGE, EMILY M., The anatomy and morphology of the inflorescences and flowers of *Ephedra*. Ann. Botany **26**:953–985. *figs. 21. pl. 85*. 1912.

E. altissima revealed a long series of intermediate forms. This suggests that the solitary ovule of *Ephedra* and of *Welwitschia* represents a fusion of "the many ovules and interseminal scales of such a flower as *Cycadeoidea*."

THOMPSON[7] has attacked the problem of the affinities of the Gnetales with the anatomical weapons forged in the study of the conifers and the primitive dicotyledons. In this first paper the genus *Ephedra* is considered, the anatomical features being described in detail. The idea that *Ephedra* may be connected with the Bennettitales or the Cycadales receives no support from the anatomy; on the contrary, the suggestions of relationship to the Coniferales are numerous (arrangement of primary vascular bundles, double leaf trace, arrangement and structure of the tracheid pits, bars of Sanio, tertiary spirals, trabeculae and resin plates, primitive uniseriate lignified rays, wood parenchyma, and endarch leaf bundles). It is further evident that the group could not have arisen from any of the modern conifers, but rather "from or close to the base of the coniferous line." An angiospermous affinity is indicated clearly "by the possession of true vessels, broad rays, formation of broad rays by fusion, and separation of the leaf traces." These general conclusions are abundantly confirmed by the morphological evidence.

Miss BERRIDGE[8] has discovered that a ring of complex groups of vascular strands arises from the bundles in the base of the ovulate "flower" of *Gnetum Gnemon*, and suggests that this may indicate that the ovule was "primitively surrounded by a whorl of male flowers." This would mean that the ovulate strobilus of *Gnetum* was originally bisporangiate.—J. M. C.

Evolution of araucarians.—Probably the most discussed question in connection with the phylogeny of conifers is the relationship of the araucarians to the Abietineae. So far as the historical evidence goes, the two tribes are rivals in age, and the araucarians seem to have been the dominant coniferous vegetation during the Mesozoic. The complete separation of araucarians from Abietineae, by suggesting either their direct origin from the Cordaitales or even from club-mosses, is an idea that has entered into the discussion.

JEFFREY has been a staunch defender of the primitive character of the Abietineae, and of the derivation of the araucarian type from this stock. In a paper just published,[9] he attacks the problem of the evolution of the araucarian type on the basis of a study of abundant material of the existing forms, which is compared critically with the mesozoic material. So far as the evidence of history and anatomy goes, the whole series, from the abietineous stock to

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[7] THOMPSON, W. P., The anatomy and relationships of the Gnetales. I. The genus *Ephedra*. Ann. Botany **26**:1077–1104. *figs. 2. pls. 94–97.* 1912.

[8] BERRIDGE, EMILY M., The structure of the female strobilus in *Gnetum Gnemon*. Ann. Botany **26**:987–992. *figs. 4.* 1912.

[9] JEFFREY, E. C., The history, comparative anatomy, and evolution of the *Araucarioxylon* type. Proc. Amer. Acad. **48**:531–571. *pls. 7.* 1912.